

Appendix 6

NOISE DATA CORRECTIONS FOR TESTS AT HIGH ALTITUDE TEST SITES

1. INTRODUCTION

Jet noise generation is somewhat suppressed at higher altitudes due to the difference in the engine jet velocity and jet velocity shear effects resulting from the change in air density. Use of a high altitude test site for the noise test of an aeroplane model that is primarily jet noise dominated should include making the following corrections. These jet source noise corrections are in addition to the standard pistonphone barometric pressure correction of about 0.1 dB/100 m (0.3 dB /1000 ft) which is normally used for test sites not approximately at sea level, and applies to tests conducted at sites at or above 366 m (1200 ft) mean sea level (MSL).

2. JET NOISE SOURCE CORRECTION

2.1 Flight test site locations at or above 366 m (1200 ft) MSL, but not above 1219 m (4000 ft) MSL, may be approved provided the following criteria (Figure 6-1) are met and source noise corrections (paragraph 2.3) are applied. Alternative criteria or corrections require the approval of the certificating authority.

2.2 Criteria

Jet source noise altitude corrections from paragraph 2.3 are required for each one-half second spectrum when using the integrated procedure and at the PNLTM spectrum when using the simplified procedure (see paragraph 9.3 and 9.4 of Appendix 2 of Annex 16, Volume 1), and are to be applied in accordance with the following criteria:

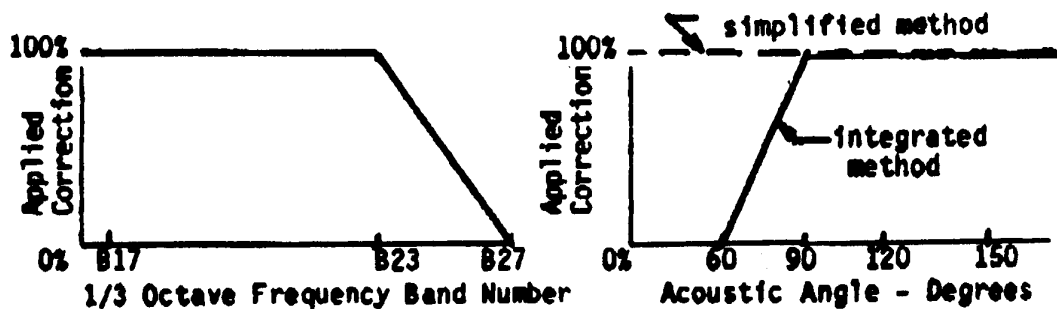


Figure 6-1

2.3 Correction Procedure

An acceptable jet source noise correction is as follows:

- Correct each one-half second spectrum (or PNLTM one-half second spectrum, as appropriate) in accordance with the criteria of paragraph 2.2 using the following equation:

$$\Delta \text{SPL} = \left[10 \log(d_R/d_T) + 50 \log(c_T/c_R) + 10k \log(u_R/u_T) \right] [F1] [F2]$$

where: Subscript *T* denotes conditions at the actual aeroplane test altitude above MSL under standard atmospheric conditions, i.e. ISA+10°C and 70% relative humidity;

Subscript *R* denotes conditions at the aeroplane reference altitude above MSL (i.e. aeroplane test altitude above MSL minus the test site altitude) under standard atmospheric conditions, i.e. ISA+10°C and 70% relative humidity;

d_R is the density for standard atmosphere at the aeroplane reference altitude in kg/m^3 (lb/ft^3);

d_T is the density for standard atmosphere at the aeroplane test altitude in kg/m^3 (lb/ft^3);

c_R is the speed of sound corresponding to the absolute temperature for standard atmosphere at aeroplane reference altitude in m/s (ft/s);

c_T is the speed of sound corresponding to the absolute temperature for standard atmosphere at aeroplane test altitude in m/s (ft/s);

$k = 8$, unless an otherwise empirically derived value is substantiated;

$u = (v_e - v_a)$ is the equivalent relative jet velocity in m/s (ft/s)

where: v_e is the equivalent jet velocity as defined in SAE ARP876D, Appendix C (January 1994) and obtained from the engine cycle deck in m/s (ft/s); and

v_a is the aircraft velocity in m/s (ft/s)

u_R is the equivalent relative jet velocity in m/s (ft/s) where v_e is determined at $N1_{\text{TEST}}$ for standard atmosphere at the aeroplane reference altitude;

u_T is the equivalent relative jet velocity in m/s (ft/s) where v_e is determined at $N1_{\text{TEST}}$ for standard atmosphere at the aeroplane test altitude;

$N1C$ is the corrected engine rpm $\left(N_1 / \sqrt{q_{T_2}} \right)$;

$F1$ is a factor corresponding to the percentage of applied correction related to acoustic angle in Figure 6-1 (values range from 0.00 to 1.00); and

$F2$ is a factor corresponding to the percentage of applied correction related to the one-third octave band in Figure 6-1 (values range from 0.00 to 1.00).

b) For each one-third octave band SPL, arithmetically add the altitude jet noise correction in a) above to the measured SPL's to obtain the altitude source jet noise corrected SPL's for paragraph 4.1.3a of Appendix 2 of Annex 16, Volume 1.

c) The above altitude correction is to be applied to all measured test data including approach conditions (unless it can be substantiated that the jet noise during approach does not contribute significantly to the total aircraft noise).